

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 Claim 1 (currently amended): For use with a node, a  
2 method comprising:  
3 a) accepting, using the node, status information  
4 from at least two different protocols;  
5 b) composing, using the node, an aggregated message  
6 including the status information from the at least  
7 two different protocols as data within the  
8 aggregated message; and  
9 c) sending, using the node, the aggregated message  
10 towards a neighbor node.

1 Claim 2 (currently amended): The method of claim 1  
2 further comprising:  
3 d) maintaining, using the node, a first timer for  
4 tracking a send time interval, wherein the acts of  
5 composing the aggregated message and sending the  
6 aggregated message are performed after expiration of  
7 the first timer; and  
8 e) restarting, using the node, the first timer  
9 after the aggregated message is sent.

1 Claim 3 (previously presented): The method of claim 2  
2 wherein the aggregated message further includes a dead  
3 time interval, and wherein the send time interval is less  
4 than the dead time interval.

1 Claim 4 (previously presented): The method of claim 2  
2 wherein the aggregated message further includes a dead

3 time interval, and wherein the send time interval is no  
4 more than one third of the dead time interval.

1 Claim 5 (original): The method of claim 2 wherein the  
2 send time interval is less than one second.

1 Claim 6 (original): The method of claim 2 wherein the  
2 send time interval is less than 100 msec.

1 Claim 7 (previously presented): The method of claim 1  
2 wherein the aggregated message further includes a dead  
3 time interval.

1 Claim 8 (previously presented): The method of claim 1  
2 wherein the act of sending the aggregated message  
3 includes providing the aggregated message in an Internet  
4 protocol packet.

1 Claim 9 (previously presented): The method of claim 8  
2 wherein the act of sending the aggregated message towards  
3 the neighbor node includes setting a destination address  
4 in the Internet protocol packet to a multicast address  
5 associated with routers that support aggregated protocol  
6 liveness.

1 Claim 10 (original): The method of claim 1 wherein the  
2 neighbor node has at least one protocol peering with at  
3 least one of the at least two protocols.

1 Claim 11 (original): The method of claim 1 wherein the  
2 status information includes a protocol state selected  
3 from a group of protocols states consisting of (A)

4 protocol up, (B) protocol down, (C) protocol not  
5 reporting, and (D) protocol restarting.

1 Claim 12 (currently amended): For use with a node, a  
2 method comprising:

- 3 a) receiving, using the node, an aggregated message  
4 including  
5 i) for a first set of at least two different  
6 protocols of a neighbor node, status  
7 information for each of the protocols of the  
8 first set of the at least two different  
9 protocols as data within the aggregated  
10 message, and  
11 ii) a time interval; and  
12 b) updating, using the node, neighbor node protocol  
13 status information using the aggregated message.

1 Claim 13 (currently amended): The method of claim 12  
2 wherein the act of updating neighbor node protocol status  
3 information includes

- 4 i) setting, using the node, a first timer to  
5 the time interval and starting the first timer,  
6 ii) if the first timer expires, setting, using  
7 the node, the status of each of the protocols  
8 of the neighbor node to down, and  
9 iii) if a further message, sourced from the  
10 neighbor node, and including  
11 A) for a second set of at least two  
12 protocols, status information for each of  
13 the protocols of the second set, and  
14 B) a new time interval,

15 is received then, resetting, using the node,  
16 the first timer to the new time interval and  
17 restarting the first timer.

1 Claim 14 (original): The method of claim 13 wherein each  
2 of the time interval and the new time interval is less  
3 than one second.

1 Claim 15 (original): The method of claim 12 wherein the  
2 status information includes a protocol state selected  
3 from a group of protocols states consisting of (A)  
4 protocol up, (B) protocol down, (C) protocol not  
5 reporting, and (D) protocol restarting.

1 Claim 16 (currently amended): The method of claim 13  
2 wherein the act of updating neighbor node protocol status  
3 information further includes

4 iv) if the further message is received then,  
5 in addition to resetting the first timer to the  
6 new time interval and restarting the first  
7 timer, further

8 A) determining, using the node, whether  
9 the first set of at least two protocols is  
10 the same as the second set of at least two  
11 protocols,

12 B) if the first set of at least two  
13 protocols is determined to be the same as  
14 the second set of at least two protocols,  
15 then for each of the at least two  
16 protocols of both the first and second  
17 sets having a changed status, informing,  
18 using the node, a locally running instance

19 of the protocol of the changed status of  
20 its peer protocol of the neighbor node,  
21 and  
22 C) if the first set of at least two  
23 protocols is determined to be different  
24 from the second set of at least two  
25 protocols, then  
26 1) for any protocol in the second  
27 set but not in the first set,  
28 informing, using the node, a locally  
29 running instance of the protocol of  
30 the status indicated in the further  
31 message of its peer protocol of the  
32 neighbor node, and  
33 2) for any protocol in the first set  
34 but not in the second set, informing,  
35 using the node, a locally running  
36 instance of the protocol that the  
37 status of its peer protocol of the  
38 neighbor node is down.

1 Claim 17 (currently amended): The method of claim 16  
2 wherein each of the aggregated message and the further  
3 message include an indication of a relative message age,  
4 and wherein the act of updating neighbor node protocol  
5 status information includes,  
6 iv) if the further message is received then,  
7 in addition to resetting the first timer to the  
8 new time interval and restarting the first  
9 timer, further

10           A) determining, using the node, whether  
11           the further message is younger than the  
12           aggregated message, and  
13           B) if it is determined that the further  
14           message is not younger than the aggregated  
15           message, then discarding, using the node,  
16           the further message.

1   Claim 18 (currently amended): The method of claim 13  
2   wherein each of the aggregated message and the further  
3   message include an indication of a relative message age,  
4   and wherein the act of updating neighbor node protocol  
5   status information includes,  
6           iv) if the further message is received then,  
7           in addition to resetting the first timer to the  
8           new time interval and restarting the first  
9           timer, further  
10           A) determining, using the node, whether  
11           the further message is younger than the  
12           aggregated message, and  
13           B) if it is determined that the further  
14           message is not younger than the aggregated  
15           message, then discarding, using the node,  
16           the further message.

1   Claim 19 (previously presented): A method for monitoring  
2   liveness of multiple protocols, the method comprising:  
3       a) determining, at a first node, status information  
4       for at least two different protocols;  
5       b) sending, from the first node, an aggregated  
6       message including the determined status information

7 for the at least two different protocols as data  
8 within the aggregated message to a second node;  
9 c) receiving, at the second node, the aggregated  
10 message; and  
11 d) updating, by the second node, first node  
12 protocol status information using the aggregated  
13 message.

1 Claim 20 (previously presented): The method of claim 19  
2 wherein the aggregated message further includes a first  
3 time interval, and wherein the act of updating neighbor  
4 node protocol status information includes  
5 i) setting a timer to the first time interval;  
6 ii) starting the timer;  
7 iii) determining whether or not a further  
8 message including protocol status information  
9 is received from the first node by the second  
10 node before the expiration of the timer; and  
11 iv) if it is determined that a further message  
12 including protocol status information is not  
13 received from the first node by the second node  
14 before the expiration of the timer, then  
15 informing peer protocols of the second node  
16 that the at least two protocols of the first  
17 node are down.

1 Claim 21 (original): The method of claim 19 wherein the  
2 status information includes a protocol state selected  
3 from a group of protocols states including at least (A)  
4 protocol up, (B) protocol down, (C) protocol not  
5 reporting, and (D) protocol restarting.

1 Claim 22 (previously presented): A machine-readable  
2 medium having stored thereon a machine readable  
3 aggregated message comprising:  
4 a) status information, for at least two different  
5 protocols of a node, of a state of each of the at  
6 least two protocols stored as data within the  
7 aggregated message; and  
8 b) a dead interval.

1 Claim 23 (previously presented): The machine-readable  
2 medium of claim 22 wherein the status information  
3 indicates a protocol state selected from a group of  
4 protocols states consisting of (A) protocol up, (B)  
5 protocol down, (C) protocol not reporting, and (D)  
6 protocol restarting.

1 Claim 24 (original): The machine-readable medium of  
2 claim 22 further comprising:  
3 c) an identifier of the node.

1 Claim 25 (original): The machine-readable medium of  
2 claim 24 wherein the node is a router and wherein the  
3 identifier is a router identifier.

1 Claim 26 (original): The machine-readable medium of  
2 claim 22 further comprising:  
3 c) an interface index.

1 Claim 27 (currently amended): For use with a node,  
2 ~~[[elements]]~~ apparatus comprising:  
3 a) at least one processor;  
4 b) at least one input device; and



5        c) at least one storage device storing  
6        processor-executable instructions which, when  
7        executed by one or more processors, perform a method  
8        including  
9            ~~[[a]]~~ i) ~~[[means-for]]~~ accepting status  
10          information from at least two different  
11          protocols~~[[+]]~~ ,  
12          ~~[[b]]~~ ii) ~~[[means-for]]~~ composing an  
13          aggregated message including the status  
14          information from the at least two different  
15          protocols as data within the aggregated  
16          message~~[[+]]~~ , and  
17          ~~[[c]]~~ iii) ~~[[means-for-for]]~~ sending the  
18          aggregated message towards a neighbor node.

1    Claim 28 (currently amended): The ~~[[elements]]~~ apparatus  
2    of claim 27 wherein the method further includes  
3    ~~[[comprising+]]~~  
4          ~~[[d]]~~ iv) ~~[[means-for]]~~ maintaining a first timer  
5          for tracking a send time interval, wherein the  
6          ~~[[means-for]]~~ act of composing the aggregated  
7          message and sending the aggregated message compose  
8          and send the aggregated message after expiration of  
9          the first timer~~[[+]]~~ , and  
10          ~~[[e]]~~ v) ~~[[means-for]]~~ restarting the first timer  
11          after the aggregated message is sent.

1    Claim 29 (currently amended): The ~~[[elements]]~~ apparatus  
2    of claim 28 wherein the aggregated message further  
3    includes a dead time interval, and wherein the send time  
4    interval is less than the dead time interval.

1 Claim 30 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 28 wherein the aggregated message further  
3 includes a dead time interval, and wherein the send time  
4 interval is no more than one third of the dead time  
5 interval.

1 Claim 31 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 28 wherein the send time interval is less than  
3 one second.

1 Claim 32 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 23 wherein the send time interval is less than  
3 100 msec.

1 Claim 33 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 27 wherein the aggregated message further  
3 includes a dead time interval.

1 Claim 34 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 27 wherein the ~~[[means-for]]~~ act of sending the  
3 aggregated message includes ~~[[include-means-for]]~~  
4 providing the aggregated message in an Internet protocol  
5 packet.

1 Claim 35 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 34 wherein the ~~[[means-for]]~~ act of sending the  
3 aggregated message includes ~~[[include-means-for]]~~ setting  
4 a destination address in the Internet protocol packet to  
5 a multicast address associated with routers that support  
6 aggregated protocol liveness.

1 Claim 36 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 27 wherein the neighbor node has at least one  
3 protocol peering with at least one of the at least two  
4 protocols.

1 Claim 37 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 27 wherein the status information includes a  
3 protocol state selected from a group of protocols states  
4 consisting of (A) protocol up, (B) protocol down, (C)  
5 protocol not reporting, and (D) protocol restarting.

1 Claim 38 (currently amended): For use with a node,  
2 ~~[[elements]]~~ apparatus comprising:  
3 a) at least one processor;  
4 b) at least one input device; and  
5 c) at least one storage device storing  
6 processor-executable instructions which, when  
7 executed by one or more processors, perform a method  
8 including  
9 [[a]] i) ~~[[an input for]]~~ receiving, using the at  
10 least one input, an aggregated message including  
11 [[i]] A) for a first set of at least two  
12 different protocols of a neighbor node, status  
13 information for each of the protocols of the  
14 first set of the at least two different  
15 protocols as data within the aggregated  
16 message, and  
17 [[ii]] B) a time interval[[+]] , and  
18 [[b]] ii) ~~[[means for]]~~ updating neighbor node  
19 protocol status information using the aggregated  
20 message.

1 Claim 39 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 38 wherein the ~~[[means-for]]~~ act of updating  
3 neighbor node protocol status information ~~[[include]]~~  
4 includes  
5 ~~[[i]]~~ A) ~~[[means-for]]~~ setting a first timer  
6 to the time interval and starting the first  
7 timer,  
8 ~~[[i]]~~ B) ~~[[means-for]]~~ setting the status of  
9 each of the protocols of the neighbor node to  
10 down if the first timer expires, and  
11 ~~[[i]]~~ C) ~~[[means-for]]~~ if a further message,  
12 sourced from the neighbor node, and including  
13 ~~[[A]]~~ 1) for a second set of at least two  
14 protocols, status information for each of  
15 the protocols of the second set, and  
16 ~~[[B]]~~ 2) a new time interval,  
17 is received, ~~[[for]]~~ resetting the first timer  
18 to the new time interval and restarting the  
19 first timer.

1 Claim 40 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 39 wherein each of the time interval and the new  
3 time interval is less than one second.

1 Claim 41 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 38 wherein the status information includes a  
3 protocol state selected from a group of protocols states  
4 consisting of (A) protocol up, (B) protocol down, (C)  
5 protocol not reporting, and (D) protocol restarting.

1 Claim 42 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 39 wherein the ~~[[means-for]]~~ act of updating

3 neighbor node protocol status information further  
4 ~~[[information include]]~~ includes  
5 ~~[[iv) means for]]~~  
6 ~~[[A]]~~ D) determining whether the first set of  
7 at least two protocols is the same as the  
8 second set of at least two protocols,  
9 ~~[[B]]~~ E) if the first set of at least two  
10 protocols is determined to be the same as the  
11 second set of at least two protocols, then for  
12 each of the at least two protocols of both the  
13 first and second sets having a changed status,  
14 informing a locally running instance of the  
15 protocol of the changed status of its peer  
16 protocol of the neighbor node, and  
17 ~~[[G]]~~ F) if the first set of at least two  
18 protocols is determined to be different from  
19 the second set of at least two protocols,  
20 1) for any protocol in the second set but  
21 not in the first set, informing a locally  
22 running instance of the protocol of the  
23 status indicated in the further message of  
24 its peer protocol of the neighbor node,  
25 and  
26 2) for any protocol in the first set but  
27 not in the second set, informing a locally  
28 running instance of the protocol that the  
29 status of its peer protocol of the  
30 neighbor node is down.

1 Claim 43 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 42 wherein each of the aggregated message and  
3 the further message include an indication of a relative

4 message age, and wherein the ~~[[means for]]~~ act of  
5 updating neighbor node protocol status information  
6 ~~[[include]]~~ includes,  
7 ~~[[iv) means for]]~~  
8 ~~[[A]]~~ D) determining whether the further  
9 message is younger than the aggregated  
10 message, and  
11 ~~[[B]]~~ E) if it is determined that the further  
12 message is not younger than the aggregated  
13 message, then discarding the further message.  
14

1 Claim 44 (currently amended): The ~~[[elements]]~~ apparatus  
2 of claim 39 wherein each of the aggregated message and  
3 the further message include an indication of a relative  
4 message age, and wherein the ~~[[means for]]~~ act of  
5 updating neighbor node protocol status information  
6 ~~[[include]]~~ includes,  
7 ~~[[iv) means for]]~~  
8 ~~[[A]]~~ D) determining whether the further  
9 message is younger than the aggregated  
10 message, and  
11 ~~[[B]]~~ E) if it is determined that the further  
12 message is not younger than the aggregated  
13 message, then discarding the further message.

1 Claim 45 (previously presented): A system comprising:  
2 a) a first node adapted to  
3 i) determine status information for at least  
4 two different protocols, and  
5 ii) send an aggregated message including the  
6 determined status information for the at least

7 two different protocols as data within the  
8 aggregated message to a second node; and  
9 b) the second node adapted to  
10 i) receive the aggregated message; and  
11 ii) update first node protocol status  
12 information using the aggregated message.

1 Claim 46 (previously presented): The system of claim 45  
2 wherein the aggregated message further includes a first  
3 time interval, and wherein the act of updating the first  
4 node protocol status information includes  
5 A) setting a timer to the first time  
6 interval;  
7 B) starting the timer;  
8 C) determining whether or not a further  
9 message including protocol status  
10 information is received from the first  
11 node by the second node before the  
12 expiration of the timer; and  
13 D) if it is determined that a further  
14 message including protocol status  
15 information is not received from the first  
16 node by the second node before the  
17 expiration of the timer, then informing  
18 peer protocols of the second node that the  
19 at least two protocols of the first node  
20 are down.

1 Claim 47 (original): The system of claim 46 wherein the  
2 status information includes a protocol state selected  
3 from a group of protocols states including at least (A)

4 protocol up, (B) protocol down, (C) protocol not  
5 reporting, and (D) protocol restarting.

1 Claim 48 (previously presented): The method of claim 1  
2 wherein the status information is local protocol status  
3 information.

1 Claim 49 (previously presented): The method of claim 1  
2 wherein the status information is local status  
3 information and wherein each of the at least two  
4 different protocols is bring run locally on the node.

1 Claim 50 (new): The method of claim 1 wherein the status  
2 information of at least one of the at least two different  
3 protocols included in the aggregated message includes a  
4 protocol state set to protocol not reporting.

1 Claim 51 (new): The method of claim 1 wherein the status  
2 information of at least one of the at least two different  
3 protocols included in the aggregated message includes a  
4 protocol state set to protocol restarting.

1 Claim 52 (new): The method of claim 12 wherein the  
2 status information of at least one of the at least two  
3 different protocols included in the first set of at least  
4 two different protocols included within the aggregated  
5 message includes a protocol state set to protocol not  
6 reporting.

1 Claim 53 (new): The method of claim 12 wherein the  
2 status information of at least one of the at least two  
3 different protocols included in the first set of at least



4 two different protocols included within the aggregated  
5 message includes a protocol state set to protocol  
6 restarting.